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The militarization of outer space: an analysis of the current international dynamics at play

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Abstract

Today we are facing an incremental militarization of outer space, which is not only more congested and contested, but it is also starting to be considered by many nations as a warfare domain. This paper intends to give an overview of the current international dynamics at play in the militarization of outer space, identifying the main actors involved, their actions, postures and capabilities development, in order to examine whether these are encouraging international cooperation and the agreement of new governance rules or enhancing military competition and a possible conflict. It also aims to examine the current legal regime that regulates space activities, which is being challenged by new technological developments and states' growing interest in space, and the different dimensions of conflict in outer space and its possible impact on the international community.

Key words: militarization, outer space, conflict in space, space law, deterrence, security dilemma, space powers, governance mechanisms, international dynamics

Contents

> "The world today is wobbling on the precipice of a threatening new arms race in outer space, a development that would be simultaneously dangerous and expensive, as well as eminently avoidable" (Koplow 2018:332).

1. Introduction

The military use of outer space is now in the spotlight considering the growing number of countries and commercial actors that are getting involved in space, but also because of the enormous and increasing importance of this domain for a full range of civilian, commercial and military activities, thus revealing today's reliance and dependence on space-based capabilities and operations. As a matter of fact, Koplow (2018:331) points out that "any significant threat or disruption in the availability of space assets would be massively, and possibly permanently, disruptive".

We are facing new international and geopolitical tensions and changes, as well as the recent appearance of new major space powers with advanced space technology that could use outer space for military purposes in pursuance of dominating other states. All this have led to an incremental militarization of space, which is not only more congested and contested, but it is also starting to be considered by many nations as a warfare domain. Hence, several space powers as the United States, China, Russia, India, Iran, and North Korea are developing counterspace capabilities or even reorganizing their armed forces. In addition, an intergovernmental military alliance such as NATO has recently recognized space as a new "operational domain" and is increasingly relying on it for most of its operations and missions, which makes space an essential asset for the organization.

This paper is addressed to international relations and foreign policy experts who are interested in the space domain, and to aerospace engineers or similar who are interested in geopolitics and international relations. Its aim is to give an overview of the current international dynamics at play in the militarization of outer space, identifying the main actors involved, their actions, postures and capabilities development, in order to examine whether these are encouraging international cooperation and the agreement of new governance rules or enhancing military competition and a possible conflict. It also intends to examine the current legal regime that regulates space activities, the different dimensions of conflict in outer space and its possible impact on the international community.

"Outer space" is commonly considered to start at an altitude of 100 km above the Earth, where a conventional aircraft would need to reach orbital speed to maintain flight. However, there is no internationally agreed legal definition or delimitation of such zone and the reason could be, as asserted by Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics at National Geographic (2018), that "once you agree on a boundary of space, you agree on a boundary where space law applies".

With this paper we intend to answer the following questions:

1. What implications does the increasing militarization of outer space have for the current international relations?

2. Who are the major players in the militarization of outer space?

3. Is the international community developing peaceful mechanisms for the governance of outer space?

In order to analyze the current international dynamics at play in the militarization of outer space, we have carried out a qualitative research by reviewing the existing literature aiming to have a conceptual and empirical framework. We have used articles and papers addressing the current debates on the space domain and reports from specialized organizations and institutions about current space security challenges. We have structured the paper into four main sections: "The possible dimensions of conflict resulting from the militarization of space", where we identify the changing context of space, the ongoing debates regarding the definitions of militarization and weaponization, and the current legal framework on space activities. The second part includes three key concepts from geopolitics that are pertinent to analyze today's international system: deterrence, spheres of influence and security dilemma. The third section is "The postures and developments of major space powers", where relevant strategic postures, changes and developments carried out by the main space powers are identified and analyzed. In the fourth and final section, "The development of governance mechanisms", we expose the recent governance initiatives that have been put forward to substitute and update the existing legal framework, and the possibilities of cooperation in space.

2. The possible dimensions of conflict resulting from the militarization of space

In this section we identify and define various key concepts that we believe are crucial in order to tackle the topic of this paper: conflict in space, militarization and weaponization of outer space. We also examine the current legal framework that regulates space activities.

2.1 A changing context in space

Today, the outer space domain is undergoing significant changes. In 2019, the Air Force Space Command of the United States stated that the US was facing an "increased understanding of the value of space capabilities to national defense and overall national power".

There is a proliferation of assets and actors operating systems in outer space, more countries now consider outer space to be a domain of warfare and there is a growing dependence from states on space capabilities for a full range of civilian and military services. As a matter of fact, Koplow (2018:337) asserts that "the modern "use" of satellites has evolved into a "reliance" upon them, which has graduated into a "dependence," and eventually generated a "vulnerability." Moreover, according to Pace (2017), besides a growing number of nations, intergovernmental organizations (e.g. COPUOS or UNOOSA) and non-state actors such as commercial companies (e.g. SpaceX and Blue Origin) and scientific and academic entities are also involved in outer space by owning, operating or benefiting from space systems and space-derived information. In fact, space is now fully integrated into all aspects of the modern life: global communications, financial operations, navigation, or weather forecasting are some examples. Furthermore, the existing military and civilian overlap of space technology makes it hard to distinguish between offense and defense in space.

"In parallel, rising tensions and changes in the balance of power are reviving a new era of great power competition, crystallized in the space domain and deeply affecting the global space arena" (European Space Policy Institute, 2020:6). Indeed, for decades, the United States had no rival in space, but today, the country is observing the appearance of new opponents, such as China and Russia, whose strategic aim is also to be undefeated in space, thus contributing to nourish a general sense of suspicion.

2.2 What does "conflict in space" mean?

In the Space Security Index, West (2019:vi) reports that "as on Earth, activities in outer space are subject to cooperation, competition, and conflict. (…) And, increasingly, competition —particularly military competition— risks escalating into conflict".

Throughout this paper, the term "conflict" is used to refer to two different types of outer space conflict. On the one hand, we are referring to an "armed/technological conflict" which includes operations concerning dual-use assets such as debris removal technology, kinetic weapons[1] (e.g. anti-satellite missiles, also called ASAT), directed-energy weapons[2] (e.g. blinding lasers) or electronic warfare[3] (e.g. satellite jamming or spoofing), but also cyberspace threats[4]. These weapons, because of their duality, according to the European Space Policy Institute (2020:17), "contribute to the destabilization of the global space environment, which makes it difficult to decipher the ultimate intent behind the development".

On the other hand, we are referring to a "political/diplomatic conflict" that embodies geopolitical tensions and mistrust, rhetorical hostility, and little consensus-building, as well as lack of restraints to maintain outer space for peaceful uses.

According to the Executive Summary from the European Space Policy Institute (2020:1), "threats to the safety and security of the space infrastructure have multiplied, diversified and intensified". Moreover, "a growing number of states now see outer space as a

[1] Kinetic weapons: "designed to destroy satellites without placing the weapon system or any of its components into orbit. These Systems typically consist of a fixed or mobile launch system, a missile, and a kinetic kill vehicle. These weapons could also be launched from aircraft. Once released, the kinetic kill vehicle uses an onboard seeker to intercept the target satellite" (Defense Intelligence Agency, 2019:10).
[2] Directed energy weapons (DEW): "use directed energy to disrupt, damage, or destroy enemy equipment and facilities. These weapons, which can have effects ranging from temporary to permanent, include lasers, high-power microwaves, and other types of radiofrequency weapons. It can be difficult to attribute the origin of a DEW attack, depending on the type" (Defense Intelligence Agency, 2019:9).
[3] Electronic warfare (EW): "used to control the electromagnetic spectrum. EW can be challenging to attribute and distinguish from unintentional interference. Uplink jamming is directed toward the satellite and impairs services for all users in the satellite reception area. Downlink jamming has a localized effect because it is directed at ground users, such as a ground forces unit using satellite navigation to determine their location. Spoofing deceives the receiver by introducing a fake signal with erroneous information" (Defense Intelligence Agency, 2019:9).
[4] Cyberspace threats: "cyberspace pervades all other warfighting domains, including space, and many space operations depend on cyberspace and vice versa. With sophisticated knowledge of satellite C2 and data distribution networks, actors can use offensive cyberspace capabilities to enable a range of reversible to nonreversible effects against space systems, associated ground infrastructure, users, and the links connecting them" (Defense Intelligence Agency, 2019:9).

warfighting domain and believe that conflict on Earth could extend to space or that conflict might begin in space" (West, 2019:137).

2.3 The militarization and weaponization of space

Space militarization can be described as "any activity in space, which is executed by a man-made object incorporated *de jure* or *de facto* in the military organization of a State." (Vermeer, 2010:69). But is it space militarized? According to Paulauskas (2020), space has been militarized since the beginning of the "space age" and it brings not only efficiency and effectiveness to military operations, but also precision and lethality to strike capabilities. However, he also claims that, at the same time, it remains peaceful and safe since "no kinetic inter-state conflict or aggression has ever taken place in space".

The United Nations Institute for Disarmament Research (UNIDIR) (2018) coincides with the idea that military activities began as soon as human activities started in space. It also adds that militarization of outer space "implies using space capabilities to facilitate operations on Earth" and points out that the current tendency is "the blending of commercial and military activities" since the military sector is increasingly contracting commercial operations.

In spite of that, according to the UNIDIR (2018), "the security concern that gains most attention is the "weaponization of outer space" which is considered as a different term from militarization and, although it remains difficult to define, it could refer to the deployment or use of the aforementioned weapons in outer space. UNIDIR (2018) also states that the difficulty to distinguish between a "peaceful space object" and a "hostile space weapon" lies on the "dual-use nature of space technology" and therefore, in this paper we focus on the militarization rather than the weaponization of outer space.

2.4 The regulation of outer space activities

In 1967, ten years after the launch of Sputnik I, the Earth's first artificial satellite, the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" entered into force. This, commonly known as the Outer Space Treaty (OST), is "the foundational space treaty that serves as the 'constitution' for international space activity and provides the framework for the present-day legal regime regulating outer space" (Ford, 2017:240). Aiming to

promote international cooperation, its principles mainly stress that the exploration and use of outer space shall be for peaceful purposes and for the benefit and use of all countries, that activities are to be carried out in accordance with international law, that no nuclear weapons or weapons of mass destruction shall be placed in orbit or on any celestial body and that all states shall be responsible and liable for damage caused by their space activities and objects.

However, some experts believe that the treaty leaves some wiggle room and it is ambiguous. The European Space Policy Institute (2020:6) states that it "promotes peaceful endeavors in space but does not set a specific framework regarding its weaponization". And, according to Ford (2017:241), "it is fraught with ambiguities that cripple its effectiveness and prevent it from carrying out its purposes in a time that needs it most". He indicates that there has been different interpretations and approaches in accomplishing the treaty, hence it is ineffective to ensure the non-militarization of space. Some countries adopted the term "peaceful purposes" mentioned in the treaty with a "non-military" view, whereas some others, such as the U.S., consider "peaceful" as "non-aggressive" thus, allowing self-defense against outer space threats.

In addition to the OST, which remains the basic guideline of international space law, there are four other treaties related to outer space activities: the Astronaut Rescue Agreement (1968), the Liability Convention (1972), the Registration Convention (1976) and the Moon Agreement (1984). Nonetheless, there has not been much progress in international space law for the last decades, consequently, according to West (2019:vii), "there is widespread international recognition that the existing regulatory framework is insufficient to meet current and future challenges facing the outer space domain" and it is "no longer suited to the nature of modern counter-space capabilities" (Gittins, 2019:76). This, according to Nasu (2020), "does not bode well for the premise that international law must guide space activities in the interest of maintaining international peace and security and promoting international cooperation".

The aforementioned five treaties that address activities in outer space were negotiated at the Committee on the Peaceful Uses of Outer Space (COPUOS), which is the UN body that develops laws and principles governing outer space activities, although it does not deal with military space issues. The international forum and "the body responsible for

matters related to weapons in space and other space security issues" that reports its annual findings to the United Nations General Assembly (UNGA) is the Conference on Disarmament (CD) (Secure World Foundation, 2013).

3. Conceptual framework

In this section we propose the conceptual framework of the paper, where three relevant features of geopolitics and the international relations field such as "deterrence", "spheres of influence" and "security dilemma" are presented to help us analyze and understand the current dynamics of the relations among states in the space domain. The three are highly topical at the moment; the first one because key space powers are developing military capabilities as a deterrence strategy, the second one because the balance of power has changed and so has the international order, and the third one because it is still a major governing principle of today's foreign policy.

3.1 Deterrence in space

Rühle (2015) describes "deterrence" as "the threat of force in order to discourage an opponent from taking an unwelcome action" and claims there are two ways of achieving this: a) deterrence by denial, which he describes as the capability of denying the enemy's war objectives by convincing him that his attack will not succeed, and b) deterrence by punishment, which means threatening the opponent with a proportionate or symmetric retaliation in case of pursuing the undesirable action.

However, he underlines the fact that deterrence is also about interests, not only military balances. Consequently, "if the opponent's interest in achieving a certain objective is higher than one's own, deterrence may fail" (Rühle, 2015).

We believe deterrence to be important for our paper, not only because the space domain has been linked to nuclear deterrence since the Cold War, but also because it is currently one of the main topics of debate within the space defense domain. Recently, according to the European Space Policy Institute (2020:18), key space actors have accentuated the relevance of deterrence "as a strategy to face their potential adversaries". India, for instance, is planning to develop deterrence capacities to ensure its space assets are protected, and NATO recognized that space should be on their deterrence and defense agenda.

3.2 Spheres of influence

Spheres of influence are described by Mortimer (2020) as "a geographic area where countries, usually world leading powers, exercise military, political, economic, and cultural influence over lesser powers".

Space achievements can significantly increase the attractiveness and reputation of a country and are particularly valuable when it comes to expanding national influence. After the Cold War, the whole world was considered an "American sphere" due to its overwhelming hegemony. Today, however, experts claim "unipolarity is over" and refer to a "new era of great-power competition" where China and Russia are "increasingly using their power to assert interests and values that often conflict with those of the United States" (Allison, 2020). Therefore, the existence of spheres of influence that are not "American spheres" is, nowadays, undeniable.

Moreover, Ronci (2019) points out that, in terms of space activities, the relationship between the U.S. and China remains mainly competitive rather than cooperative, with the U.S. policymakers avoiding to participate in major joint activities with China, which the author considers to reinforce the creation of multiple spheres of influence.

3.3 Security dilemma

The ambiguity of some space technology often makes it hard to distinguish between offensive and defensive purposes, peaceful and harmful intents, or military and non-military activities in the space domain. This ambivalence, in the current context of increasing geopolitical tensions and radicalized rhetoric, can have destabilizing consequences on space security leading to mistrust and insecurity, thus triggering security dilemmas. John H. Herz, who coined the term "security dilemma", asserted that groups or individuals living in an anarchic society are usually worried about their security because they fear being attacked by others.

"Striving to attain security from such attack, they are driven to acquire more and more power in order to escape the impact of the power of others. This, in turn, renders the others more insecure and compels them to prepare for the worst. Since none can ever feel entirely secure in such a world of competing units, power competition ensues, and the vicious circle of security and power accumulation is on" (Herz, 1950:157).

Therefore, the security dilemma can drive states to power competition and, according to Al-Rodhan (2019), "states are increasingly approaching space from a security angle, with aims of dominance especially given the high relevance of space assets to terrestrial military power". Thus, perceived security of space actors is decisive since the counterspace developments in their space programs are somehow based on this perception. As a matter of fact, the European Space Policy Institute (2020:13) claims that a security dilemma is currently occurring: "to defend itself from a perceived threat, each state is improving its armaments, thus increasing the fear of other states and leading them to increase even more their own arsenals".

4. The postures and developments of major space powers

In this section, we identify the major space players involved in the militarization of outer space, and the data collected from each country is structured in three categories: a) their strategic postures (political aspects, changes in their doctrines), b) their key military space programs and organizations (organizational aspects) and c) their main capabilities development (technological aspects, weapons) on the international scene during the last years. The information gathered in this section is primarily retrieved from relevant sources, such as the European Space Policy Institute, the Secure World Foundation, the Defense Intelligence Agency and the Space Security Index.

West (2019:vi) indicates in the Space Security Index that "there are currently more than 2,000 operational satellites in orbit owned by more than 70 countries, and thousands more are planned to provide new services". This supports the idea that the outer space domain is increasingly congested, and its access and use is growing rapidly. However, "beyond safety issues related to an ever more congested space environment" the European Space Policy Institute in the Executive Summary (2020:1) points out that "space systems may also become the target of deliberate attacks to physically harm the system, to permanently degrade or temporarily disrupt its capabilities or to intercept confidential information".

The European Space Policy Institute identifies China, India, Japan, Russia and the United States as the major space powers, but Weeden and Samson (2020) in the "Global counterspace capabilities: an open source assessment" also include Iran, North Korea and France in the list. They justify the selection by stating that these are "the ones most active in developing their own indigenous offensive counterspace capabilities".

In the following pages, we examine the eight aforementioned countries in order to have a broader spectrum of data that will allow us to take reliable conclusions.

4.1 China

a) Strategic posture

Even though Chinese official statements have typically been in favor of the "peaceful purposes of outer space", the People's Republic of China has shown a rising interest in space defense over the last years, which was evidenced in 2015 by the designation of space as a military domain. That year, the defense of China's national interest in space was included into China's National Security Law, thus becoming legally binding. In addition to that, space security was included as one of the key strategic interests of the country in the "Chinese defense white paper".

b) Key military space programs

Also in 2015, China restructured its space and counterspace forces and created the "People's Liberation Army Strategic Support Force" (PLA SSF) that merged space, cyberspace, and EW capabilities into joint military operations. The main goal of this organizational change, according to the European Space Policy Institute (2020:7), is "to enhance the military power of China and make the country better prepared than the United States to use space assets in wartime". To this end, and in order to hold a unified and reduced structure to control the space-based and space-related capabilities, Beijing established a "Space Systems Department" within the PLA SSF.

c) Capabilities development

With regard to the capabilities development, China owns lasers, cyber capabilities and missiles, which are most of the technologies needed to damage a space asset. Moreover, Weeden & Samson (2020) assert that "China has embarked on a sustained national effort to develop a broad spectrum of space capabilities across the civil, national security, and commercial sectors". The Asian country has been carrying out several tests of technologies and capabilities, such as ASAT and laser tests, that could be used as offensive counterspace weapons. However, some experts believe that it is not clear whether China's intentions are to use its counterspace capabilities in a future conflict, or to use them just as a deterrence mechanism against the aggression of an opponent.

4.2 France

a) Strategic posture

It was in 2006 when France first recognized the space domain as "a sector of vital importance" and, following this statement, the country released several national strategies and policies addressing space defense. These documents stressed a change of the French logic regarding space: from considering it a domain that merely offered operational support to a warfighting domain. The French leader, Emmanuel Macron, has recently declared that "space has become a true national security issue" and that both the outer space and the cyberspace have become "the new confrontation zones".

b) Key military space programs

The major change that France is undergoing is the implementation of the French Space Defense Strategy, that was unveiled in 2019 and that, according to Weeden & Samson (2020), "elevates French military space organization and reassigns control of French military satellites from the French space agency to the military". The said strategy includes the creation of a Space Command that, as stated by the French Prime Minister, should "enable the country to defend itself in space and through space", and its two main areas of focus are "to improve space situational awareness around French satellites and protect them actively against threats".

c) Capabilities development

Even though Paris has had a space program and military satellites for many years, it was not until the strategy was released, that the country had an explicit interest on the improvement of space defense capabilities. As a matter of fact, France is, today, the only European state that has announced the creation of patrolling nanosatellites and the incorporation of lasers to its spacecrafts in order to be able to protect on its own its space assets against a potential attack.

4.3 India

a) Strategic posture

India has many years of experience with space capabilities, but mostly for civil purposes. It was only in the 2000s that it started using space for military purposes. According to the

European Space Policy Institute (2020:8), the Chinese ASAT test of 2007 was a "wake-up call for Indian leaders, thus leading to major changes from 2008", such as the release of the "Defense Space Vision 2020", a new doctrine defining the roadmap for the military forces in the domain of space and calling for an increase of dual-use assets.

b) Key military space programs

In addition, India created the "Defense Space Agency" in order to manage, together with the Indian Space Agency and the Defense Research and Development Organization, the potential dangers that their space assets could face. This agency is considered to be the starting point for the creation of a future military command with an exclusive focus on space.

c) Capabilities development

In March 2019, India destroyed a satellite orbiting the Earth, thus becoming the fourth country in the world —after China, Russia, and the U.S.— to successfully test ASAT. It was one of its own, but it proved the country's ASAT capability and, although Weeden & Samson (2020) consider that "this capability is more likely to be useful as a bargaining chip or a way to demonstrate that India is keeping pace with China", they also remark that it could be "moving toward an offensive counterspace posture".

4.4 Iran

a) Strategic posture

Iran maintains its aerospace activities are transparent and peaceful but admits the importance of space and counterspace capabilities for strategic aims and will not allow the use of space by an opponent during a conflict.

b) Key military space programs

The country has an ambitious space program that has evolved over the years and it supports both civilian and military activities "including boosting national pride, economic development, and military modernization" (Defense Intelligence Agency, 2020:31). Besides this program, it has been reported a parallel military space program monitored by the Islamic Revolutionary Guard Corps (IRGC).

c) Capabilities development

On April 2020, the IRGC launched its first military satellite into low-Earth orbit, which proofed not only the existence of a military space program, but also Iran's military ambitions in space. However, some experts consider that the country does not possess the capacity of building direct-ascent anti-satellite capabilities and, also, assert that its efforts seem to be focused on electronic warfare and cyberattacks rather than on kinetic counterspace capabilities. Indeed, Tehran has proved the development of EW capabilities to jam communications and commercial satellite signals.

4.5 Japan

a) Strategic posture

Japan has historically been an important space actor with a vision of space as a peaceful domain, therefore, its activities have always been non-military. The Japanese military forces did not have access to space assets nor the data emanating from them. Nonetheless, this pacifistic position has gradually evolved over the years towards a more military and security use of space. In 2008, also triggered by the ASAT test of China, the Basic Space Law was published allowing national security-related activities in space, thus permitting the use of space for military purposes. Moreover, Japan has recently emphasized the importance of the alliance with the U.S. in order to ensure peace and security in outer space and cyberspace.

b) Key military space programs

The Japanese Prime Minister announced, in January 2020, the reorganization of its military space activities with the formation of a space defense unit to "protect the country from potential threats". In addition, it has been proclaimed that, in 2022, 100 people would be assigned to the Space Domain Mission Unit, which will "monitor space debris, collect intelligence on foreign space capabilities and conduct satellite-based navigation and communications" (Weeden & Samson, 2020).

c) Capabilities development

Japan's leader has admitted that it is indispensable to adapt to the full new range of modes of warfare, which integrate capabilities in the traditional domains (sea, air and land) and

in new domains such as space, cyberspace and electromagnetic spectrum. He also noted that, in order to ensure superiority, Japan is willing to explore whether to develop offensive counterspace capabilities, but it currently does not possess any or very limited.

4.6 North Korea

a) Strategic posture

North Korea's doctrine regarding the use of space and counterspace capabilities is unclear. The country has officially stated that "the principle is the development of space thoroughly for peaceful purposes" and has defended its right to be a space power and the peaceful use of space. The Defense Intelligence Agency (2020:32) considers that, like Iran, the country "will try to deny an adversary use of space during a conflict". Furthermore, it is believed that most of North Korea's military capabilities aim to secure the regime and deter a potential aggression, with a special focus on the United States.

b) Key military space programs

The Democratic People's Republic of Korea has, according to the Center for Strategic and International Studies (2018:19), "an active space program that is closely related to its missile program" which is administered by the National Aerospace Development Administration, and that has notably made some progress over the last years.

c) Capabilities development

At the same time, the country has made some progress developing its cyberattack and jamming capabilities on civilian GPS signals and possesses several ballistic missiles systems. However, it has not so far demonstrated kinetic counterspace capabilities nor ASAT, and experts say it does not seem to be motivated to develop them, although little is known about its technical capability.

4.7 Russia

a) Strategic posture

Russia has recognized the militarization of outer space as a "main external military danger" and has admitted "the need to exploit the overreliance of other countries on space in case of conflict" (European Space Policy Institute, 2020:14). Moscow sees space as a

warfighting domain and is convinced that, in order to win future conflicts, supremacy in space will be crucial. Furthermore, and following the announcement by the U.S. of setting up a Space Force, the Chief of the General Staff of the Russian Armed Forces stated that since Washington is "creating pretexts for militarizing space", Russia will respond with "reciprocal and asymmetrical measures".

b) Key military space programs

Moreover, Russia has recently reorganized its military space forces by merging the former air force and the aerospace defense troops into a new organization that combines space, air defense, and missile defense capabilities: the Russian Federation Aerospace Forces. The objective of this centralization of the military space actors appears to be increasing efficiency in a potential war.

c) Capabilities development

Moscow has been carrying out multiple tests of an anti-satellite missile, developing electronic warfare means, including jamming, to interfere U.S. assets in event of conflict but also to protect Russian space assets, and investing in directed-energy weapons, such as the Peresvet laser cannon, deployed since 2018 and whose mission is still unclear. Weeden & Samson (2020) state that Russia "is seeking to mitigate the superiority of U.S. space assets by fielding a number of ground-, air-, and space-based offensive capabilities."

4.8 United States

a) Strategic posture

The United States recognized the strategic importance and the vital interest of space at the end of the 1990s but, since 2014, space security and the preparation for a potential war in space has increasingly been the focus of U.S. policymakers. For instance, in September 2019, the current Secretary of Defense, Mark Esper, stated that "the next big fight may very well start in space, and the United States military must be ready". More recently, the Chairman of the Joint Chiefs of staff, Mark Milley said that "space is critical to the nation's economic interests, national security, and way of life," and also added that "in military operations, space is not just a place from which they support combat operations in other domains, but a warfighting domain in and of itself". The Pentagon has

blamed several times Russia and China, but also Iran and North Korea, considered as "potential adversaries", for militarizing space, turning it into a warfighting domain, and creating new weapons that could pose a threat to the U.S. systems. It has also outlined the need to demonstrate undisputed superiority in order to deter a potential opponent.

b) Key military space programs

This conflict-oriented rhetoric also pointed out that a conflict on Earth could be extended to space, and in order to be ready for the said eventuality and motivated by the Russian and Chinese developments, the country is reorganizing its military space activities with a renewed emphasis on space as a war fighting domain. The reorganization includes the reactivation of the U.S. Space Command in August 2019, the creation of the Space Development Agency and the creation of the U.S. Space Force in December 2019. The U.S. Space Force is the sixth branch of the armed forces, whose aim is, as stated by Mark Esper, help ensure the country "is postured to deter aggression, defend the national interests and outpace potential adversaries". According to the European Space Policy Institute (2020), this should be seen as a move to "adapt the armed forces to a changing military space landscape and achieve space dominance and control". In spite of that, the U.S. appears to be open for coalitions and cooperation with close allies in space operations.

c) Capabilities development

For decades, the United States has been the unchallenged leader in terms of military technology in space and, today, it continues to have advantage over the rest. It owns counterspace capabilities, including electronic warfare, but also multiple other operational systems that could be used as counterspace. Its budget for these capabilities has grown significantly over the last years and it has conducted several tests of ASAT missiles and the X37-B project, whose classified missions, according to the European Space Policy Institute (2020:17), "could range from the repair of satellites in orbit, to the gathering of intelligence, to an attack of other space systems".

4.9 Summary table

	Strategic posture	Key military space programs	Capabilities development
China	- Designation of space as a "military domain". - China's national interest in space: legally binding. - Space security: key strategic interest.	- Creation of "People's Liberation Army Strategic Support Force" and establishment of the Space System Department.	- Lasers, cyber capabilities, and missiles. - Tests of ASAT and lasers.
France	- Space domain: vital importance and a true national security issue. - Outer and cyberspace: new confrontation zones.	- Implementation of the French Space Defense, which includes the creation of a Space Command.	- Explicit interest on the improvement of space defense capabilities to protect its assets from attacks.
India	- Release of a new doctrine: the Defense Space Vision 2020.	- Creation of the Defense Space Agency.	- Successfully destroyed a satellite in orbit: ASAT capability.
Iran	Recognition of the strategic value of space and counterspace capabilities.	- Ambitious space program and a parallel military space program run by the IRGC.	- Launch of its 1st military satellite. - Development of EW capabilities to jam communications.
Japan	- Basic Space Law: use of space for military purposes permitted.	- Formation of a space defense unit. - 2022: Space Domain Mission Unit.	- Does not have counterspace capabilities but is actively exploring whether to develop them.
North Korea	- Lack of transparency: peaceful programs but claiming the right to be a space power. - Will try to deny an adversary use of space during a conflict.	- Active space program that is closely related to its missile program.	- Very limited military counterspace capabilities. - Cyberattack and jamming capabilities and possession of several ballistic missile systems. - Not demonstrated capability of kinetic attacks or ASAT.
Russia	- Militarization of space: main external military danger. - Need to exploit the overreliance of other countries on space in case of conflict. - Supremacy in space: decisive factor in winning future conflicts.	- New organization that combines space, air defense, and missile defense capabilities: the Russian Federation Aerospace Forces.	- Multiple tests of ASAT. - Development of EW. - Investigating in directed-energy weapons.
United States	- Preparing for a potential war in space. - Space is critical to the nation's economic interests, national security, and way of life.	- Reactivation of the U.S. Space Command. - Creation of the Space Development Agency. - Creation of the U.S. Space Force.	- Most advanced military space capabilities in the world: counterspace systems, EW capabilities, several ASAT tests.

4.10 Data analysis

The potential vulnerability of space assets has become a serious concern in the current changing international environment and has led governments of the major space powers to reconsider their strategic postures and military doctrines and to develop new capabilities. Today, most of them, even Japan, who has historically been against the use of space for military purposes, are addressing space as an operational warfighting domain together with the traditional ones. Also, countries such as France, India and Iran are recently identifying space as a strategic domain with a key role in the military and security context. Russia, China, and the U.S. have the most assertive postures with mutual recriminations that evidence the current diplomatic tension.

Moreover, several space powers have carried out significant organizational changes and have created or announced the creation of dedicated military space organizations, strategies, and policies. China and Russia justify this reorganization by claiming the need to be more efficient and better prepared in case of war, while France, India and Japan declare to be seeking to protect their own capabilities, since they are concerned that future conflicts might involve attacks on space assets and need to be defended. The most controversial of them all, however, is the U.S. Space Force presented by Donald Trump as "absolutely vital" to ensure American dominance in space.

In terms of military technology, U.S.' superiority is being challenged by China and Russia. These three countries have intensified the efforts to develop new capabilities and possess advanced electronic warfare, directed energy weapons and cyberattack capabilities. In addition, they deploy space-based weapons and destructive counterspace capabilities (such as ASAT technology) that could be used in a future conflict. India has also proven ASAT capabilities although its counterspace posture remains unclear. These kinetic capabilities, however, have never been used to attack another country's assets. Iran and North Korea are making significant progress and "are developing, testing, or even using non-destructive counterspace capabilities, such as jamming or spoofing" (Weeden, 2019), although these are, together with cyberattacks, less sophisticated and cheaper. France intends to improve its national counterspace capabilities and Japan is considering whether to develop them.

The intent behind all these capabilities, however, is not easy to discern because of their duality and the fact that they could also serve for purposes such as satellite servicing or debris removal. Indeed, the ambivalence of this technology contributes to enhance mistrust and hostility between space powers.

Overall, the collected data indicates that all major space actors are approaching space from a security angle, reorganizing its space and military organizations in order to be more efficient in case of a conflict. Some, such as the United States, China, and Russia, are improving its armaments and developing counterspace capabilities with aims of dominating space. All these actions, improvements and changes show there is a power competition occurring that is justified by the political leaders of these countries by claiming the need to protect space assets against a potential threat and the fear of a possible attack from an opponent. We can thus assume that the paradox of the security dilemma is currently taking place in the international system. An example of the dilemma could be India and Japan, who officially started using space for military purposes after China's ASAT test. The two states sought to enhance their own security after feeling threatened by Beijing. At the same time, China excused the enhancement of its space military power by declaring the need to be better prepared than the U.S. in case of a conflict. However, it was also the fear of being eclipsed by Russia's and China's developments what motivated the creation of the U.S. Space Force.

In parallel, we can also observe that deterrence strategies are increasingly present in the international panorama. Most of the countries that are investing in either kinetic weapons, directed energy weapons or electronic warfare claim their intention is to persuade a potential opponent not to start a particular action, because the cost would be higher than the benefit. Thus, protecting their assets from foreign attacks. The United States, for instance, has claimed its goal is to convince any potential adversary that they could never carry out a successful attack to the American space assets, so that they would never even try it. North Korea's aim with its capabilities development seems to be discouraging an aggression from the U.S., and Russia has already warned Washington of responding with similar measures to mitigate its superiority.

Today, we are experiencing a new era of power competition amid escalating geopolitical tensions and new spheres of influence besides the United States. China and Russia do not

accept U.S. supremacy in space and are keeping pace with its advances. The fact that these countries are also developing counterspace capabilities will probably allow them to bolster their national power, expand their influence and have their own allies the same way they have them when it comes to terrestrial issues. Japan, for its part, values its alliance with Washington and considers it is important to ensure security to its space systems.

This political and technological rivalry shown by all major space powers suggests, once more, that space dominance is nowadays a key element to economic, political, and military power, but also to ensure victory in any conflict on Earth. For this reason, the U.S. fears its national power and interests would be at risk if it does not preserve its space leadership. But this also means, according to Ride (1987:12), being perceived as a leader and, therefore, "demonstrate prowess, inspire national pride, and engender international respect and a worldwide desire to associate with U.S. space activities".

5. The development of governance mechanisms

"Humans can overcome the frustrations and the challenges of governance—and we now have the occasion, the provocation, and the responsibility to try" (Koplow, 2018:388)

The globalization and democratization of space, according to Pace (2019), "have increased interest in issues of space governance and the potential role of space law to manage new challenges". There has been some progress in questions related to sustainability and safety in space, but West (2019:vii) asserts that "questions related to national security uses of space and the dynamics of conflict and arms control remain unresolved".

In this section of the paper, we examine the recent regulation initiatives proposed by the major space powers, the efforts that have been made in order to solve this normative problem and the possibilities of cooperation in space despite being a competitive domain.

5.1 Recent initiatives

At international level, there have been several discussions in different international forums to prevent the weaponization of outer space and to manage and regulate the

militarized space issue. Nonetheless, readings highlight two recent, ongoing, now nearly dead initiatives that we describe below.

a) Chinese and Russian proposal

In 2008, China and Russia jointly presented at the UN Conference on Disarmament a draft Treaty on the Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT). The proposed treaty would be an internationally binding agreement that, according to DeFrieze (2014:111), "attempted to define and prohibit the proliferation of weapons in space and provided definitions of prohibited weapons". However, the PPWT was rejected and criticized specially by the U.S. who "believed it was impossible to enforce and were suspicious that the proposal was a ploy by Russia and China to gain a military advantage" (Ford, 2017:255).

In 2014, an updated and revised draft addressing the objections raised in the previous version was proposed. One important feature of the PPWT, as stated by UNIDIR (2018), is that "it seeks to ban a type of behavior rather than specific types of weapons", since its aim is to "ban the placement of weapons in outer space as well as the threat or use of force against space objects". Nevertheless, it was pointed out that the instrument does not include a ready legally binding verification mechanism and the United States expressed concerns about the "lack of a ban on terrestrially-based anti-satellite weapons".

Since the first draft treaty that Russia co-sponsored with China, Moscow's "military doctrine has gradually recognized that space is the Achilles heel of the U.S., which should be exploited" (European Space Policy Institute, 2020:10). Furthermore, it has often expressed concerns over the U.S.' weaponization of space and, for this reason, it is pursuing a legal, binding agreement. Meanwhile, China's foreign ministry spokesperson, Geng Shuan, recently declared that "there is greater relevance and urgency to initiate negotiation of a legally-binding instrument on outer space arms control" and expect major countries to "adopt a prudent and responsible attitude to safeguard lasting peace and tranquility in outer space" in order to prevent it from becoming a new battlefield.

b) European Union policy proposal

Also in 2008, the European Union released a preliminary draft of the International Code of Conduct for Outer Space Activities (ICoC). The text, according to UNIDIR (2018), was "a notable effort that has sought to address the growing concerns of an arms race in outer space" and whose aim was to achieve "greater adherence to existing international instruments on space activities; increased measures for safety, security and sustainability in outer space; and cooperative mechanisms".

A more recent version of the draft was proposed in 2014. Nevertheless, Ford (2017:257) asserts that even though the Code of Conduct is "a pragmatic way for the international community to establish "rules of the road" for the use of space and aims to create an international culture of transparency and trust when it comes to the use of space", some spacefaring countries were not satisfied with it and considered it was not an effective way to avoid an arms race in space. The concerns of nations such as Russia, China, Brazil, but also India and South Africa were that it "does not include mandates for military issues in space, and that the code reinforces that countries have an inherent right to use self-defense in space" (Ford, 2017:257). Also, the fact that it is a non-legally binding, voluntary instrument was a matter of concern. In addition, some developing countries feared that the International Code of Conduct would be prepared by current major space nations in a way that would not permit their expansion into space.

It was finally decided, according to Ford (2017:258), that negotiations should be pursued "in the context of a UN General Assembly mandate", which he considers to have "killed the idea of an international code for the present time".

5.2 UN General Assembly resolutions

Every year, the UN General Assembly adopts resolutions on Prevention of an Arms Race in Outer Space (PAROS), Transparency and Confidence-building Measures in Outer Space Activities (TCBM), and International Cooperation in the Peaceful Uses of Outer Space that are not legally binding, but that are broadly supported by the international community. UNGA also has a mechanism for establishing a group of governmental experts (GGE) who meet several times over a year or two and produce a report and recommendations. In 2017, a GGE was established "to consider and make

recommendations on substantial elements of an international legally binding instrument on the prevention of an arms race in outer space, including, inter alia, on the prevention of the placement of weapons in outer space". However, experts highlight that the recent voting patterns of the two resolutions on PAROS and TCBM demonstrate lack of consensus.

All in all, it can be claimed that there is a global recognition of the need for better and additional governance mechanisms. Nevertheless, the next steps to be taken remain unclear, since none of the recent proposals, either legally binding or voluntary commitments, have been successful due to the disagreement and distrust among the key space powers, but also to "the desire of countries not to unduly limit themselves on future access, especially considering emerging technologies and defensive needs" (DeFrieze, 2014:111).

5.3 Other initiatives

West (2019:149), in the Space Security Index 2019, asserts that, besides the multilateral forums and bodies, there are currently increasing diplomatic efforts to face the governance challenges of outer space activities that are becoming more relevant. The author lists them as follows:

a) Bilateral or regional collaborations

This type of initiatives includes the work of the Asia-Pacific Regional Space Agency Forum, a regionally focused committee established to enhance space activities in the Asia-Pacific region, and also the adoption by the African Union of an African Space Policy Strategy. Groups such as the G7 and the BRICS are also included as relevant collaborations since they are "becoming more engaged with questions of space governance, including non-weaponization".

b) Nongovernmental organizations

Organizations that contributed or are trying to contribute to the space governance, according to West (2019:149), are the Union of Concerned Scientists who "drafted a model treaty banning ASAT", the Stimson Center that "proposed a code of conduct for responsible spacefaring nations", and more recently the Secure World Foundation

considered a “research body, convener, and facilitator” for a variety of space-security initiatives” or the Project Ploughshares that “explores enhancement of the security of outer space, including non-weaponization of space”. It also includes UNIDIR for “facilitating dialogue among key space stakeholders”, the Space Generation Advisory Council for bringing “the views of youth and young professionals to bear on outer space governance”, the International Committee of the Red Cross for “considering the application of international humanitarian law to outer space” or the Hague International Space Resources Governance Working Group for “formulating governance recommendations and guidelines for space resource utilization”.

c) Experts within civil society

Experts of the civil society are also involved in the clarification of the current international law and norms that regulate the military uses of space. They formulate treaty proposals and governance recommendations and guidelines for space operations. Within this category we can find the development of the McGill Manual on International Law Applicable to Military Uses of Outer Space (MILAMOS), or the Woomera Manual on the International Law of Military Space Operations.

5.4 Cooperating in times of competition

Since the beginning of the Space Age, both international cooperation and competition in space have been present and both are considered by Mains (2008:1) “basic human and societal drivers for survival, innovation and progress”. But what are the drivers for cooperating in such a competitive domain? In the following paragraphs we will explore the motivations that the international community might have for cooperating in outer space.

Today, as we have seen previously in this paper, the growing tensions and changes in the international arena are also reflected in the space domain. Other countries, besides the United States, have the strategic objective of being leaders in space and are, therefore, improving their space assets and developing capacities that could disrupt space systems. In this context, military power in space has gained importance in the international system and, consequently, there is an increasingly competition for national security space assets.

However, “space is an international common and is thus easier to protect through international cooperation” (DeFrieze, 2014:110). We have shown that traditional governance mechanisms and global political institutions have so far failed to respond to an arising security threat, which is the militarization of outer space. Therefore, international cooperation and an international dialogue on how to “address the legal uncertainties which may impair the peaceful use of outer space” is imperative (Ferreira-Snyman, 2015:520).

It is true that space defense policies remain elaborated on a national basis, and every country has its own interests and strategies, but cooperation between states is and has been significant. The Space Security Index 2019 particularly points out there is “significant cooperation around global utilities, responding to the threat of Near-Earth Objects (NEO), space weather, space situational awareness, as well as between military space programs”.

Some countries, according to Knipfer (2017), may pursue cooperation for reasons of cost and funding, because space systems and technological competencies are expensive, and they would not be able to finance them alone. Data and expertise sharing through bilateral or multilateral cooperation may also be a reason to consider. Another important benefit of space cooperation would be the diplomatic cachet; some states could use it to “support their terrestrial diplomatic and geopolitical policies and aims”.

The International Space Station (ISS) is said to be “the most politically complex civil space program ever undertaken” and, at the same time, “the most prominent example of international cooperation in the use of space”. The participating countries —United States, Russia, Japan, Canada, and the members of the European Space Agency— are committed to the ISS until 2024. However, West (2019:71) states that “the nature of cooperation around ISS is evolving” and the U.S. interest in continuing to support it in the future is uncertain.

All in all, it is clear that there are reasons and opportunities to cooperate, however, the policy of a country on space militarization can complicate international cooperation. For this reason, Adams (2019:411) mentions the importance of diplomacy when reaching an international agreement with another country and the need to “identify areas of common interest, craft agreements, and rally the political leadership needed to implement

the agreements". The agreement of new governance mechanisms is not only possible, but necessary in order to mold the behavior of states and control how they use the new space technology to prevent destructive activities.

6. Conclusions

This paper aims to be an introduction to the implications that the militarization of outer space has for the current international relations, proving both the complexity and the importance of the topic. It also aims to contribute to identifying the major space powers and their doctrines and developments regarding the space domain. Finally, it is hoped to provide an overview of the mechanisms that have been developed by the international community to govern outer space activities. It is a very broad topic that cannot in all fairness be described in a few pages, but we believe this provides a good starting point for discussion and further research, which we consider particularly necessary regarding space law and the agreement of a legally-binding instrument that regulates space activities.

The increasing militarization of outer space shows a growing competition between space powers. This growth in both militarization and competition for space dominance, together with the widespread perception of a sharply increased threat to the security and stability of outer space, is causing a political/diplomatic tension between some of the major space actors, who are expanding the exploitation of space for both military and civil uses.

The countries leading the militarization of outer space are the United States, China, and Russia, although India is also trying to follow their pace. France, Japan, Iran, and North Korea also show significant changes in their strategic postures and the creation of space military programs. Collectively, the data presented shows rhetoric about a possible armed conflict in space, bureaucratic reforms and the reorganization of the military forces to strengthen and highlight national space forces, and the active development of space capabilities with dual-use nature.

The said enhancement of space technology and its ambiguity is the result of mistrust and perceived insecurity of most states towards the others, thus leading to a security dilemma. Furthermore, the aim of most countries is to deter their opponents in order to avoid an attack and protect their space assets, so deterrence has become a crucial strategy. We have

also noticed that unipolarity and the U.S. hegemony in the space domain is over and that other countries, such as China and Russia, are also in the position of owning spheres of influence and use their power in space for their own interests, as they do on Earth.

The international community is now depending on space capabilities for a full range of activities, including security and defense purposes. That being said, an armed conflict in space would be detrimental for all. The growing reliance on space systems makes them vulnerable and, for this reason, many spacefaring states are concerned about the militarization of space.

Nevertheless, the current legal regime that regulates space activities is not keeping up. While there is an international recognition that the regulatory framework is being challenged by new technological developments and states' growing interest in space, little progress has been made. There have been some initiatives and proposals, and multilateral discussions are held within the United Nations, but no new international agreement regarding space security and arms control is being negotiated, thus in order to maintain space as a peaceful domain there is an urge for international cooperation and the identification of common interests and benefits in order to agree on a new legally binding framework.

Although it is true that no ASAT attacks have been yet carried out, the development of capabilities that could damage or interfere space systems is growing, and some countries dangerously see outer space as a warfare domain. We have shown that militarization of outer space is a reality, but does this mean there is also an arms race taking place? Will the competitive efforts to control space and the creation of anti-satellite weaponry lead to an armed conflict in space?

We have also seen that there are many reasons to cooperate and develop peaceful mechanisms for the governance of outer space. Major space players must be willing to avoid this type of confrontation and seeking for cooperation instead, since we all depend so heavily on satellite services and any damage on space assets could be extremely dangerous. Moreover, an attack in a space system would have destabilizing consequences on the balance of power on Earth.

Space and all the advantages it provides to our daily life should not be taken for granted. The militarization and weaponization of the space domain require immediate action from leaders and policymakers, and the “rules of the game” need to be established if we want to avoid a future armed conflict in outer space.

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